

Tium research

Blooming the Energy in your Device



Customized Battery Professional





Company Overview 會社 開要

- / CEO : Dr. **KIM SungChul**, about 20 years experience in battery
- / Established July, 2008 & 6-years career
- / 5-listed patents

技術

Core Technology for battery business!

- Technology of materials on core factors(i.e. cathode, anode, electrolyte...)
- Evaluation method on materials, cell, BMS & pack
- Packaging & operating skills(i.e. Pack design, BMS, communication, viewer...)

經驗

Various Experiences in battery industry!!

- Size : from subminiature cells to big battery system
- Type : LiB, LiPB, LiFP, LiS, Lead-acid...
- Device : hearing-aid, capsule endoscope, e-bike, e-scooter, ROBOT, EV...
- Client : from global companies & national laboratories to startups

協力

Alliance & Network beyond battery!!!

- Alliances with relative companies (i.e. motor, inverter, charger...)
- Network for R&D, manufacturing, equipment, etc.
- Open partnership for battery business

IPs

知的財産權

- Manufacturing Method on Lithium Battery 二次電池 製造 方法
- Microporous separator with excellent heat resistance 耐熱性 多孔性 微細 分離膜
- Estimating battery SOC by mathematical model 數學的 模型 適用 Lithium 電池 殘量預測
- Measuring the health of secondary battery 二次電池 健康狀態 診斷 裝置
- Measuring the SOC of primary battery 一次電池 殘量預測 裝置

History

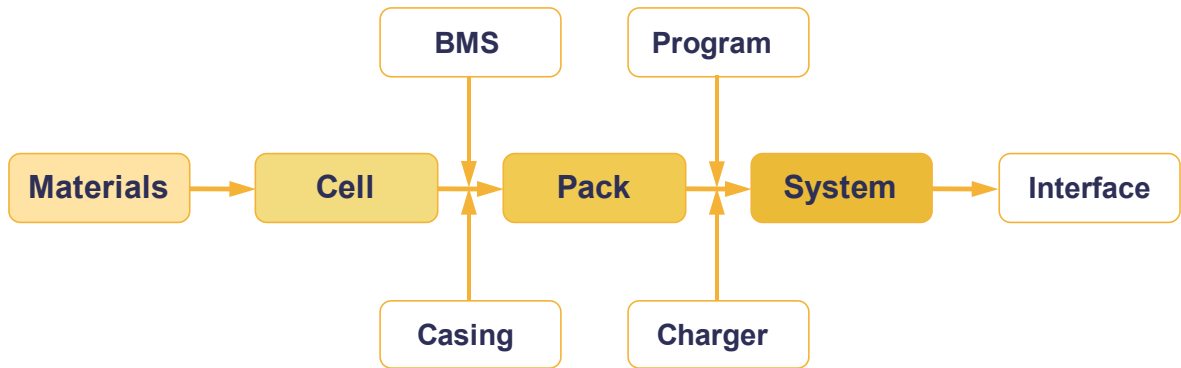
沿革

- '08/07 Founded in Daejeon, Korea 法人 設立
- '08/12 Chosen as “Innovative Research Program” (SMBA) 技術革新開發事業者 選定(中企廳)
- '09/02 Chosen as “Business Raising Planning Program of New Tech.” (SMBA)
新技術事業化 計劃 課題 選定 (中企廳)
- '09/06 Chosen as “e-Bike Development Company” (MKE) 大德特區 電氣自轉車 開發者 選定
- '10/02 Chosen as “Business Raising Program of New Tech.” (SMBA) 新技術事業化 課題 選定
- '10/10 Supply Battery pack for UAV(Unmanned Aerial Vehicle) 無人航空機用 電池 開發
- '11/04 Supply Battery pack for e-Scooter 電氣二輪車用 電池 開發
- '11/09 Supply Battery pack for Fuelcell-Generator 燃料電池發電機用 電池 開發
- '12/03 Supply Battery pack for Hybrid EV 小型 電氣車用 電池 開發
- '12/07 Supply Battery pack for AUV(Autonomous Underwater Vehicle) 無人潛水艇用 電池 開發
- '13/04 Supply Battery pack for ROBOT 放射能 觀測 ROBOT用 電池 開發
- '13/08 Authorized “Venture Company” by KIBO 技術保證基金 “Venture 企業” 認證



Business 主要事業

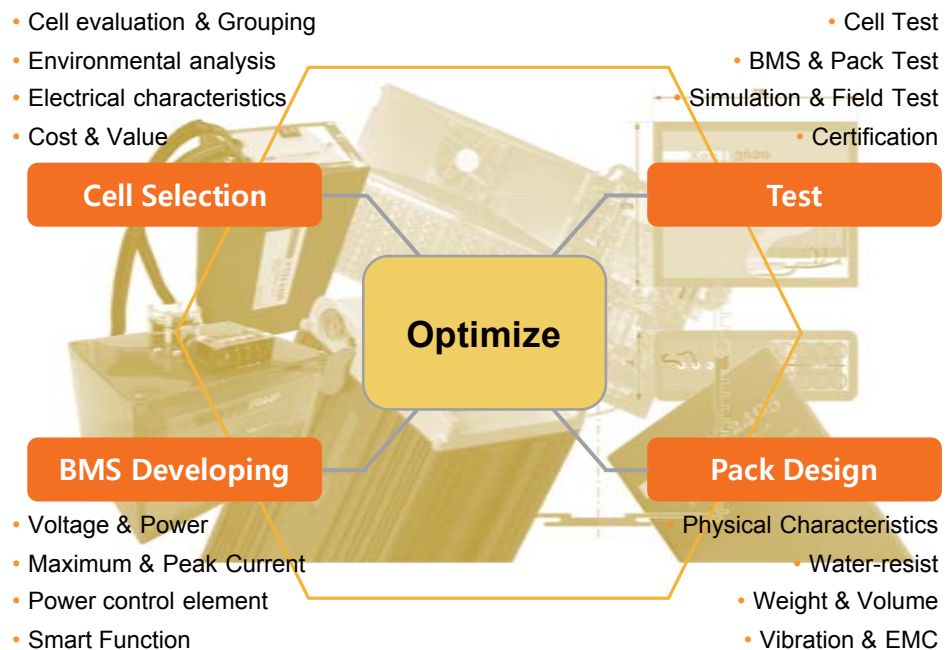
We can perform whole battery business from raw material to power system. But our main business is developing battery pack, designing BMS and consulting about battery.



Customized Battery Supply

顧客向 電池

We develop & supply the customized battery system for client. We consider voltage, current, capacity & environmental of device, and design the optimized battery pack. We supply the cell & pack which meet demand of client like as casing, price, amount, and certifications.



• 24V 05Ah	Hybrid-UAV /LiPB	• 36V 05Ah	e-Bike /LiPB
• 24V 15Ah	UAV /LIB	• 36V 80Ah	h-UAV /LIB
• 24V 18Ah	Hybrid-UAV /LIB	• 48V 20Ah	ROBOT /LiPB
• 24V 26Ah	Fuelcell Generator /LIB	• 48V 40Ah	e-Scooter /LiPB
• 24V 40Ah	ROBOT /LIB	• 60V 40Ah	e-Scooter /LiPB
• 24V 40Ah	AUV /LIB	• 88V 56Ah	EV /LIB
• 24V 75Ah	m-UAV /LIB	• 88V 60Ah	EV /LIB

BMS Design

BMS 開發

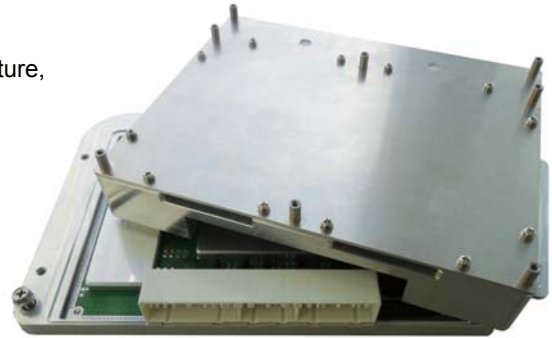
We can design & develop BMS not only considering the condition of battery but also considering communication standards, protocol, insulation, heating, cooling, etc. We can develop various Series of BMS by master-slave architecture & multi-MCU.

Protection : Over-voltage, Under-voltage, Over-current, Shot-circuit, Over-temperature, Under-temperature, etc.

Monitoring : Voltage, Current, Temperature, SOC, Relay status, Fan-status, etc.

Smart Function : Cell balancing, SOC & SOH, Self-diagnosis, Emergency, Data Back-up, etc.

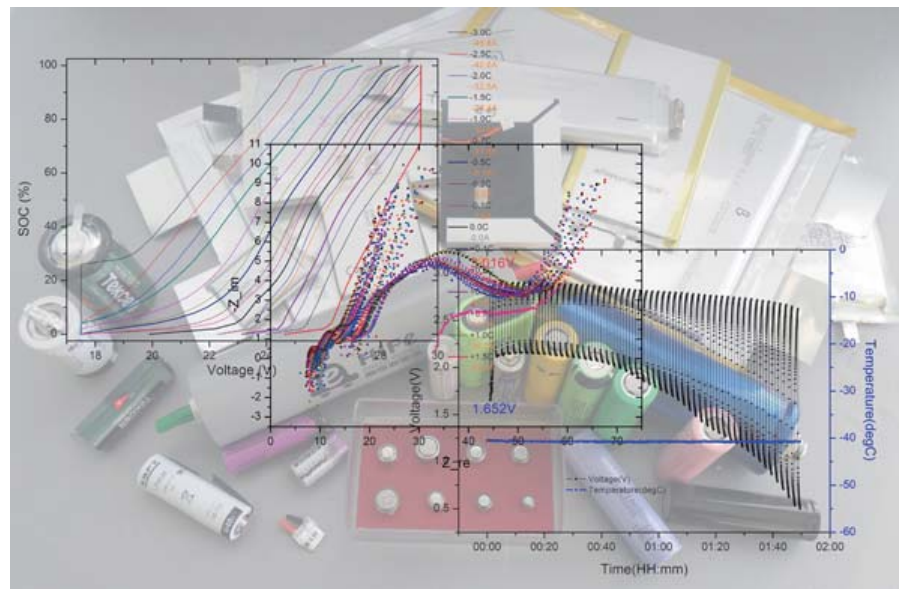
Interface : CAN, RS-422/232/485, I²C, UART, etc.



Battery Consulting

電池 諮詢

We can supply the battery evaluation and consulting service in cell selection, cell comparing and certification. We buy cells in worldwide and compare the characteristics and analyze them.



- Battery comparison analysis for low-temperature /LIB(primary & rechargeable)
- Estimating method of capacity on cell /Silveroxide cell(primary)
- Development of grade system for product /Silveroxide cell(Primary)
- C-rate & charging voltage test of 18650 battery /LIB
- EMC test by CISPR25 /24S & 6S BMS
- Battery test on low-temperature & low-atmosphere /LIB pack
- Safety test by Korea Standard of Automobile /LIB pack



Technology 主要技術

We have technology from materials to system and various experience. So we can supply the technology & experience to whole industry for safety & efficiency.

High-Tech research & realize the new technology, function, material & method

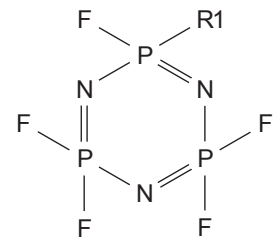
Practicality develop the better products that are suitable function & price for market

Optimization product optimize on user, device, market & environmental

Materials

素材

- Heat-resistance separator
 - Shrinkage rate : less than 10% for 10min @ 130°C
 - Shut-down temperature : 150 ~ 160°C
- High-conductive electrode
- Non-flammable electrode
 - Non-volatility and non-flammability at elevated temperature
 - Good compatibility with conventional electrolyte

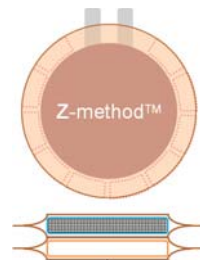


Flame retardant A

Manufacturing

製造

- Compact cell stacking method
 - Use maximum cell inner space
 - Valid holding & venting by separator
- Hermetic sealing
 - He Leakage : $1.02 \sim 1.15 \times 10^{-9}$ atm cc/sec @10min
- in-situ QC for sealing property



Z-method

Packaging

包裝

- BMS design
 - Extend many series by multi-MCU structure
 - Master-slave BMS structure
 - Low power consumption circuit design
- Smart function
 - various smart functions in BMS or control board
 - Various methods of SOC & SOH
- Case design
 - Vibration-resistance & Heat dissipation

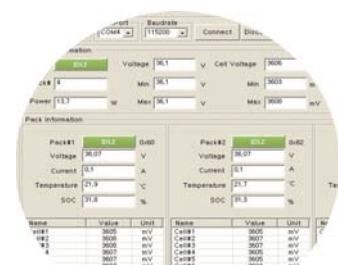


6S BMS

Others

其他

- Software developing Tech.
 - Easy UI Monitoring Program on PC or Device
 - Fit the communication protocol(i.e. I²C, CAN, RS-232/485/422)
 - Protection parameter editing
- Test & Analysis
 - Cell analysis by electrochemical evaluation method
 - Cell & pack test for certification



VOM 1.3



Product 製品紹介

Tium makes all product by client's order. After design it, we review the most characteristics. Before supply, we test the performance & safety of product again.

for UAV(Unmanned Aerial Vehicle)

無人 航空機用

Most important factor for UAV is high energy density & Safety. We have many solutions for this vehicle base on experience.

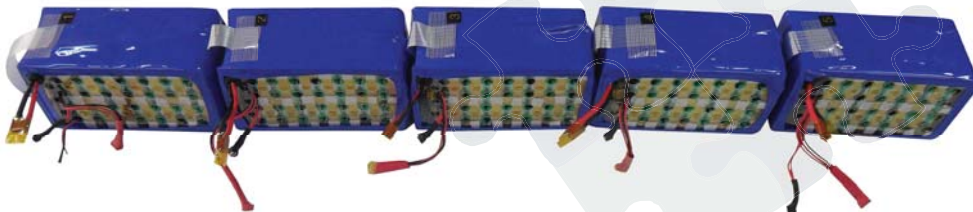
Xen p2405

- 1 Pack System
- Voltage : 24V
- Capacity : 4.5Ah
- Energy : 120Wh
- Weight : 1.2Kg
- Max Discharge Current : 45A(10C)



Xen i2416

- 5 Pack System
- Voltage : 24V
- System Capacity : 82.5Ah
- System Energy : 2.1KWh
- System Weight : 9.0Kg
- Energy Density : 230KWh/kg



Xen p3605

- 1 Pack System
- Voltage : 36V
- Capacity : 4.5Ah
- Energy : 160Wh
- Weight : 1.5Kg
- Max Discharge Current : 45A(10C)



Xen i3620

- 4 Pack System
- Voltage : 36V
- System Capacity : 80Ah
- System Energy : 2.9KWh
- System Weight : 12.8Kg
- Energy Density : 225KWh/kg
- Operating Temp. : -70 ~ 60°C
- Operating Atm. : 0.05atm.



for Electric Vehicle

電機 車輛用

Battery for EVs supply high-voltage and high-current. So we consider severe environmental like as alternative charging-discharging operation, vibration, EMC, etc.

Xen i8856

- 2 Pack System for EV
- Voltage : 88V
- System Capacity : 56Ah
- System Energy : 5.0KWh
- System Weight : 25.7Kg
- Max Discharge Current : 280A(5C)



Xen p6020

- 2 Pack System for e-Scooter
- Voltage : 60V
- System Capacity : 40Ah
- System Energy : 2.5KWh
- System Weight : 16.5Kg
- Max Speed : 80km/h
- Operating Distance : 110km

Xen p4820

- 2 Pack System for e-Scooter
- Voltage : 48V
- System Capacity : 40Ah
- System Energy : 2.0KWh
- System Weight : 7.0Kg
- Max Discharge Current : 90A(2C)

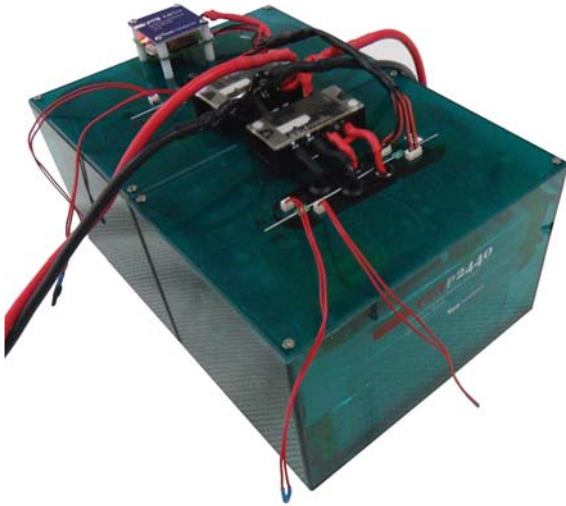


Xen p3610

- 1 Pack System for e-Bike
- Voltage : 36V
- Capacity : 10Ah
- Energy : 360Wh
- Weight : 2.5Kg
- Regenerative braking current Charging

Others 其他 製品

We have many experience in various device like as AUV, ROBOT, ITs & medical device, etc.



Xen p2440

- 2 Pack System for AUV
- Voltage : 24V
- System Capacity : 80.0Ah
- System Energy : 2KWh
- System Weight : 14.0Kg
- 1MasterBMS & 4-SubBMSs

Xen i2426

- 1 Pack System for Fuelcell Generator
- Voltage : 24V
- Capacity : 26.4Ah
- Energy : 680Wh
- Weight : 4.6Kg
- Good Performance at Low-Temperature



Xen i2413

- 1 Pack System for AUV
- Voltage : 24V
- Capacity : 13.2Ah
- Energy : 330Wh
- Weight : 1.6Kg

Xen p2420

- 1 Pack System for ROBOT
- Voltage : 24V
- System Capacity : 20Ah
- System Energy : 500Wh
- System Weight : 3.5Kg
- Max Discharge Current : 60A(3C)



Cell

單位 電池

We can design high energy density, high reliability or special sized cell because have core cell-technology & experience.

MCR 960

- Primary cell for Capsule endoscope
- Voltage : 3.0V
- Capacity : 60mAh
- Energy : 180mWh
- Weight : about 2g
- High rate discharge characteristics



MHA 730

- Rechargeable cell for Hearing-aid
- Voltage : 3.7V
- Capacity : 10mAh
- Energy : 37mWh
- Weight : about 1g
- Max Speed : 80km/h
- Environmental friendly battery



BMS

保護 回路

We have various types of BMS. Our BMS design is on a case by case different for compact size, multi-layers, multi-MCUs, multi-functions, communication or EMC-free, etc.



Low Voltage

- **3S** for Medical
- **4S** for Medical
- **5S** for UAV

24V

- **6S** for UAV, ROBOT, Generator, ITs
- **7S** for UAV, ROBOT, AUV
- **8S** for UAV, e-Scooter, e-Bike

36V

- **10S** for UAV, e-Scooter, e-Bike

48V

- **13S** for e-Scooter, e-Wheelchair
- **14S** for e-Scooter

60V

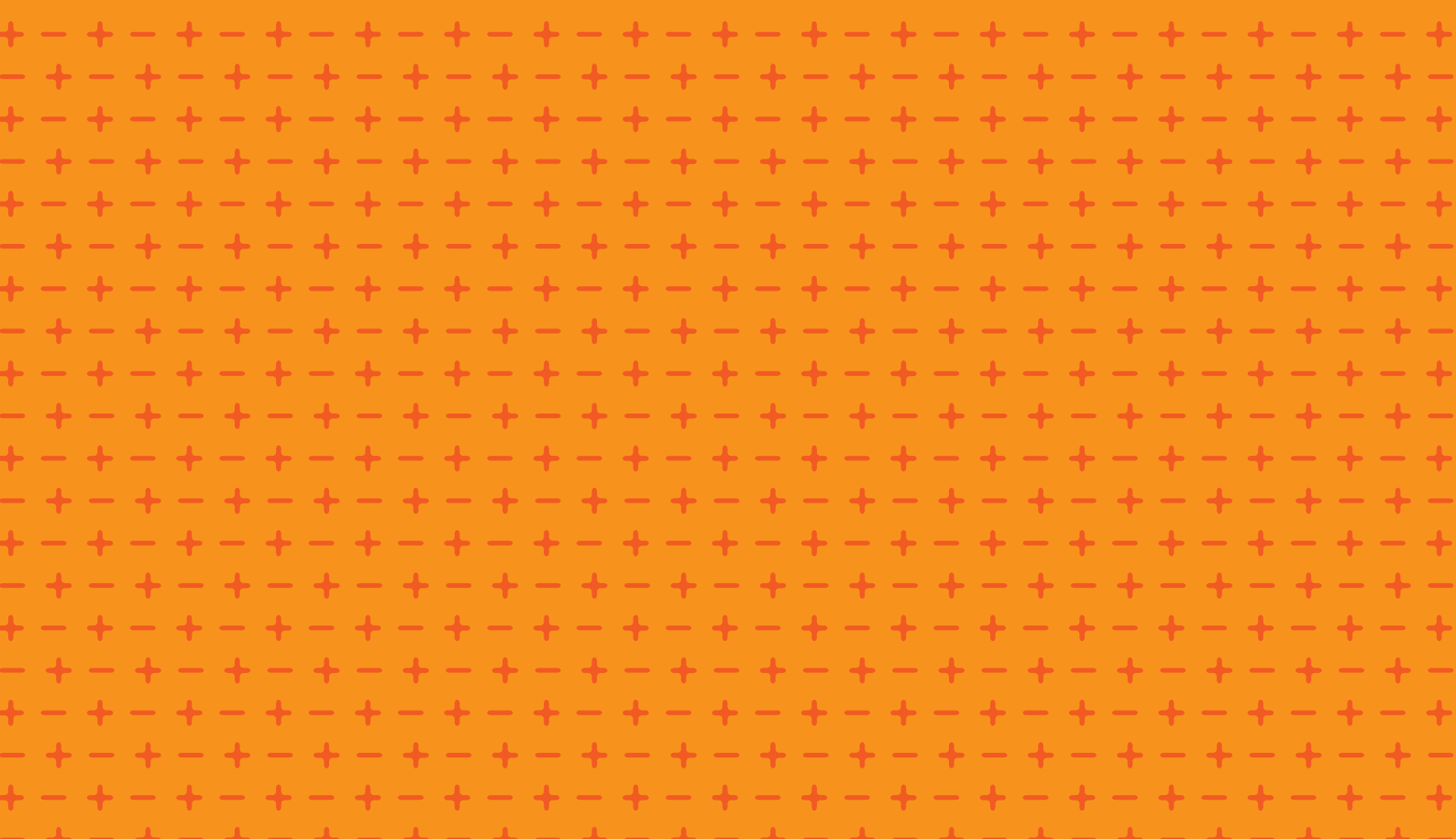
- **16S** for e-Scooter

72V

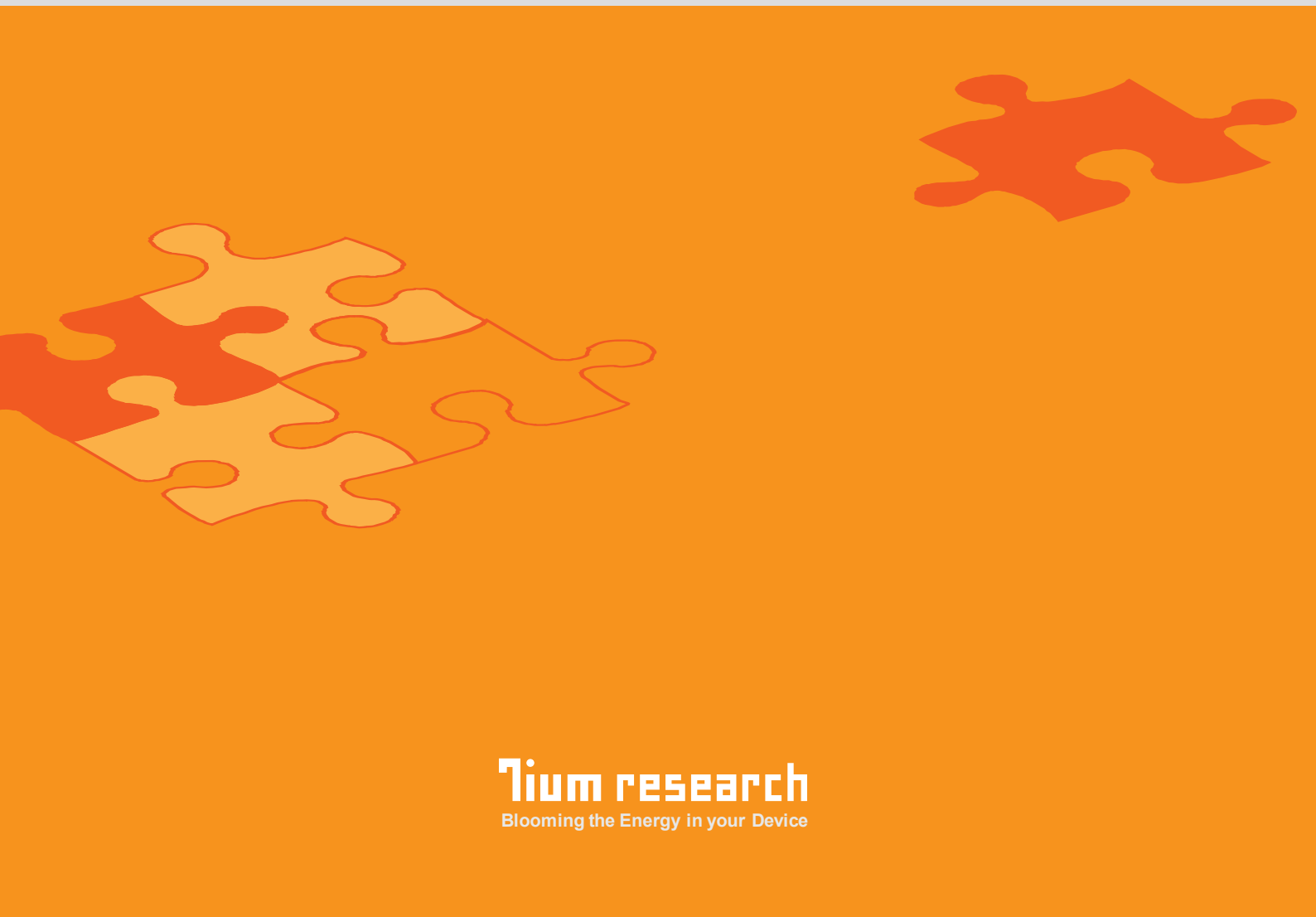
- **20S** for e-Scooter

88V

- **24S** for EV



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